COMMODORE MPS-803 DOT MATRIX PRINTER

A Friendly Introduction to Your MPS-803 Dot Matrix Printer



USER'S GUIDE

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COMPUTERS

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Table Of Contents

INTRODUCTION

Congratulations

Congratulations on your recent purchase of the COMMODORE MPS-803 Dot Matrix Printer. You have added a grete deal of versatility and convenience to the use of your COMMODORE Computer system. This User's Guide is intended to introduce you to your new Printer. It includes all the information necessary to help you . . .

- Learn the names and functions of all external parts
- Install your Printer
- Connect the Printer to your computer
- Operate and maintain your Printer
- Write Programs for your Printer

In the process of showing you how to use your new Printer, this User's Guide assumes that you are familiar with the COMMODORE BASIC computer language. To get the most out of this Guide, it is suggested that you continue to refer to your computer's **USER'S GUIDE** and **PROGRAMMER'S REFERENCE GUIDE.**

Printer Features

Your new Printer is a dot matrix printer. This MPS-803 printer is designed to operate through software control. It prints upper- and lower-case alphabetic characters, numeric characters, and all the graphic characters available on your COMMODORE computer, and even a custom user-defiened character.

Your Printer has the following features:

- Standard COMMODORE serial interface to allow easy connection to other COMMODORE computer peripheral devices
- 80 column printing
- Prints 60 characters per second
- Friction feed (Sprocket feed option)

Your Printer is designed to connect directly into your computer through the Serial Port (6 pin connector). It can be used with up to 4 Model 1541 floppy disk drives. These units are connected to the computer by "chaining" the devices together – each successive unit is plugged into the last unit connected to the the computer.

Costomer Support

Please check with your local COMMODORE dealer, COMMODORE User's Clubs and COMMODORE Magazines for additional support for your new Printer. They can also keep you informed about possible application programs written for your Printer.

CHAPTER 1
PREPARING TO USE YOUR PRINTER

A. Unpacking Your Printer

Before you unpack your printer, inspect the shipping carton for signs of damage. Be especially careful when you inspect its contents. DON'T throw away any of the packaging material until you have located all the contents of the carton! The package should contain (Refer Figure 1).

1. Commodore Printer, Model MPS-803
2. Printer Ribbon Cassette
3. Serial Cable
4. User's Guide
5. Warranty Card

If any of these is missing or damaged, notify your Commodore dealer immediately.

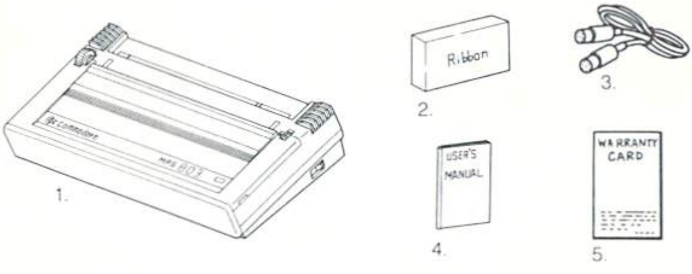


Figure 1.

B. MPS-803 Printer Physical Characteristics:

Front and Top View

Please note the following locations for MPS-803 features:

* ON-OFF switch is on the right side of the printer housing.

* A power/error indicator and Paper Advance switch are located on the front right side of the printer housing.

PARTS	OPERATION & FUNCTION
a. Power Switch:	Turns printer ON and OFF
b. Power/Error Indicator:	Lights up when printer is turned on. If a paper empty occures, this indicator flashes. Paper empty can be recovered by re-installing paper and press Paper Advance Switch.
c. Top Cover:	Use your cover to protect your printer from dust and to reduce the noise level while the printer is in operation. And this top cover has paper cutter.
d. Paper Advance Knob:	Once you have properly threaded your paper, you can use the Paper Advance Knob to move the paper in forward direction only.
e. Paper Advance Switch:	Use this switch to move the paper ahead, 1 line at a time in the forward direction only! And self-diagnostic printing starts when power is turned on with this switch depressed.
f. Paper Release Lever:	Releases paper in order to install paper smoothly and adjust in right position.

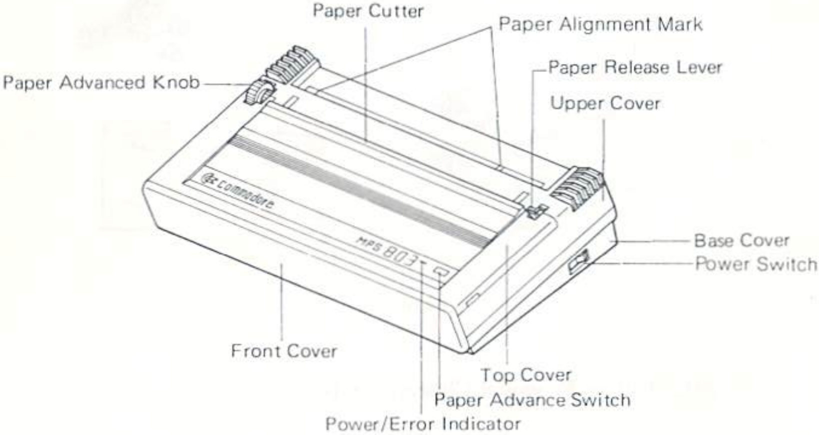


Figure 2.

Back View:

Turn your Printer around so that you can look at the back of the unit as shown below. On the left side you will see the power line connection. On the center,

you will see two serial interface connectors to connect the unit to your computer.

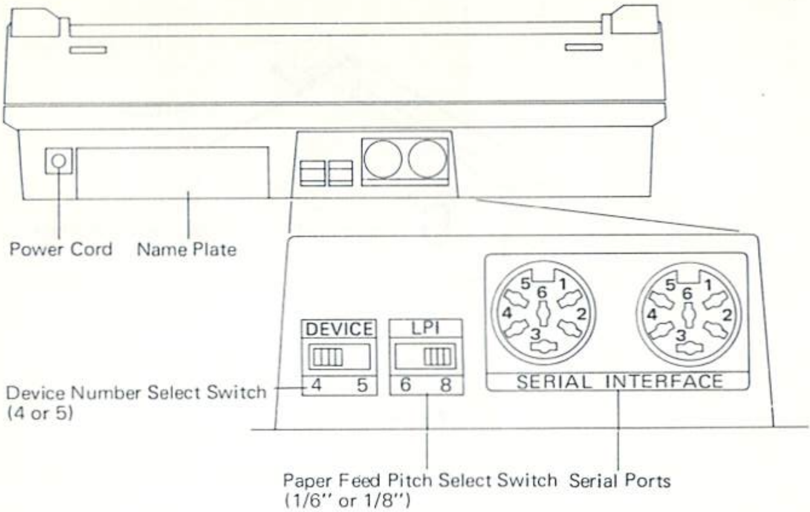


Figure 3.

a. Power Cord:	Connect wallet outlet.
b. Serial Ports:	These connectors are used to connect your Printer to the computer. Use the Serial Interface cable supplied with the printer. Refer to Chapter 1 part G for complete connection instructions.
c. Device Number Select Switch:	Use this switch to select the device number (4 or 5).
d. Paper Feed Pitch Select Switch:	Use this switch to select the line feed amount (1/6" or 1/8").
e. Name Plate:	This plate describes Model Name, required power source voltage, and aquired standards.

C. Installing and Removing The Ribbon Cassette

1. Installing the Ribbon Cassette

a. Locate the packet that contains the ribbon cassette. You should have received this packet in the same box that your printer come in.

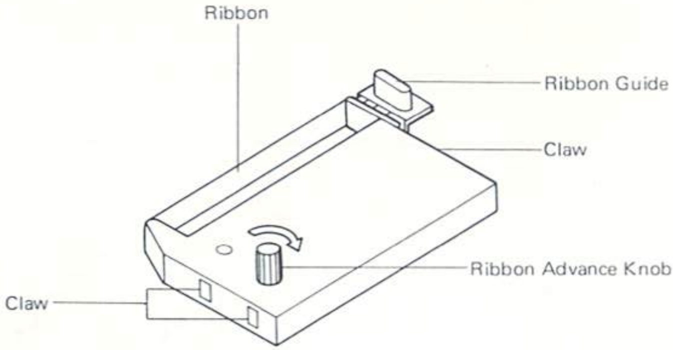


Figure 4.

b. Remove the ribbon cassette from the packet and place it carefully in front of you.

c. Look at the cassette. You will notice that one side has a ribbon advance knob.

d. Rotate ribbon advance knob in the direction of the arrow until all the slack is taken out of the ribbon.

e. Turn off the power and remove the top cover. To remove it, lift up by holding both sides and pull to the direction of the arrow. (See Figure 5)

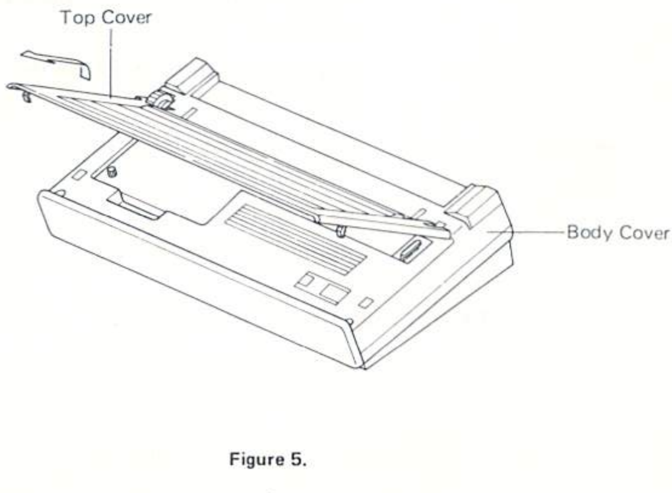


Figure 5.

f. Move the print head toward the center of the setting space of the ribbon cassette.

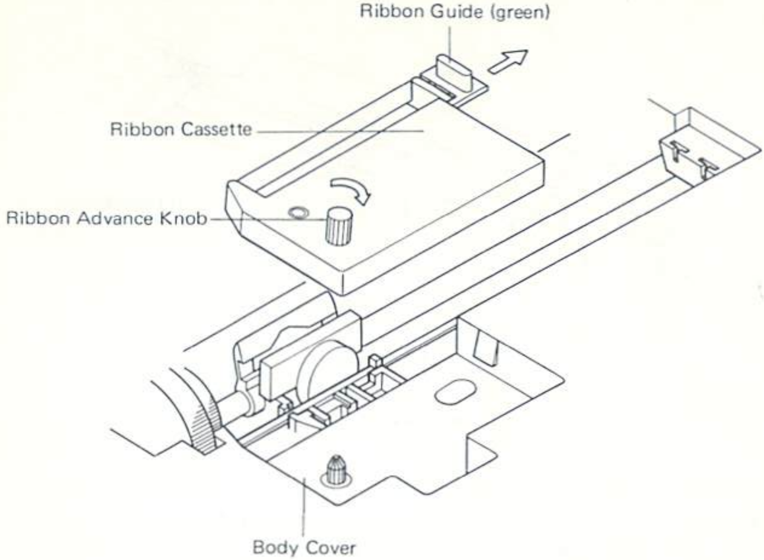


Figure 6.

g. Place the ribbon between carriage and print head (See Figure 6), and set the ribbon cassette to the body cover (See Figure 7).

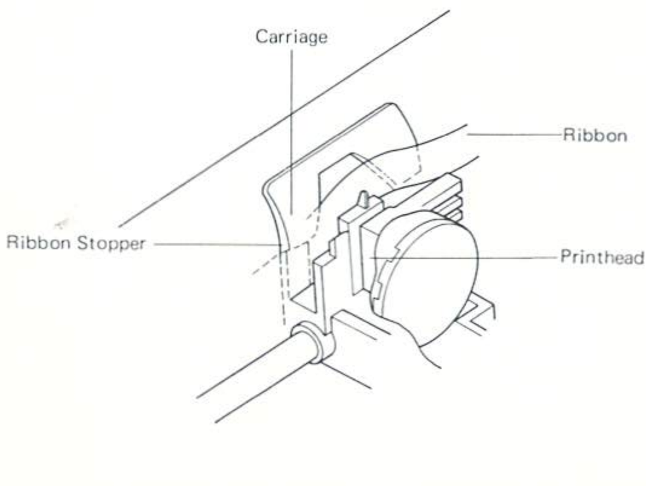


Figure 7.

h. Turn the knob until the upper ribbon edge comes into ribbon stopper.

i. Pull the ribbon guide toward right horizontally, and set it to the body cover.

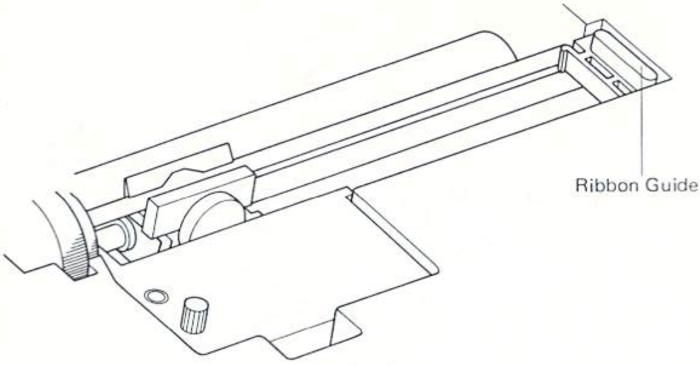


Figure 8.

j. Turn the green knob to take up slack.

NOTE: 1) Please make sure that ribbon is not twisted.
2) Check again that the upper ribbon edge is in ribbon stopper.

k. Put the top cover.

2. Removing the Ribbon Cassette

a. Turn off the power and remove the top cover (See Figure 8).

b. Pull up the ribbon cassette and ribbon guide.

D. Paper Instructions

1. Paper Loading Instructions

a. Push the paper release lever to the direction of OPEN (clockwise), and insert the paper into the slot shown with the arrow.

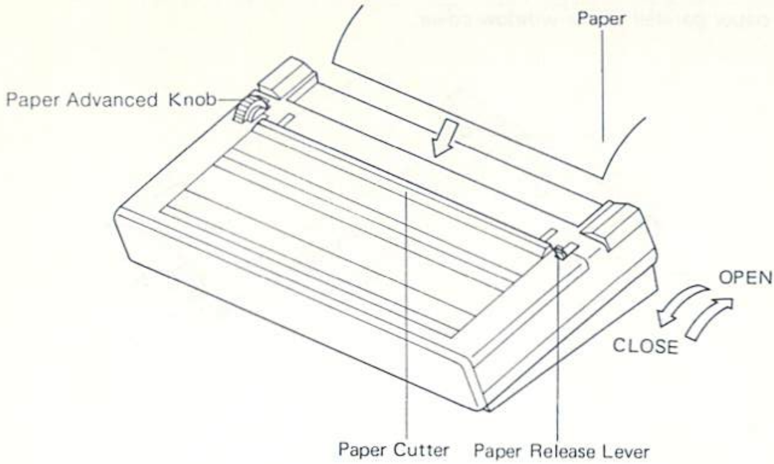


Figure 9.

b. Pull the paper release lever to the direction of CLOSE (anti-clockwise). Turn the Paper Advance Knob to the direction of the arrow (clockwise) to advance paper until the edge of the paper comes out of the window cover.

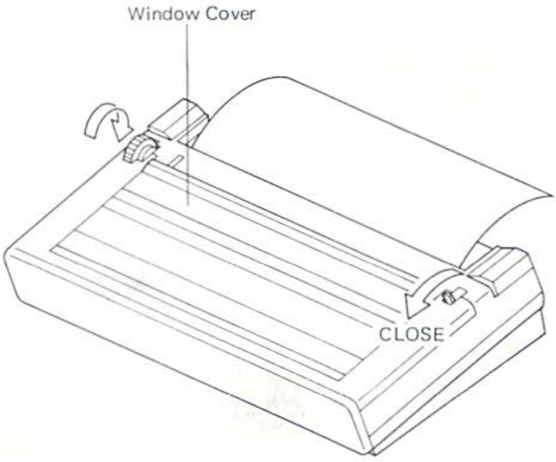


Figure 10.

c. Push the paper release lever toward OPEN, and make the upper edge of the paper parallel to the window cover.

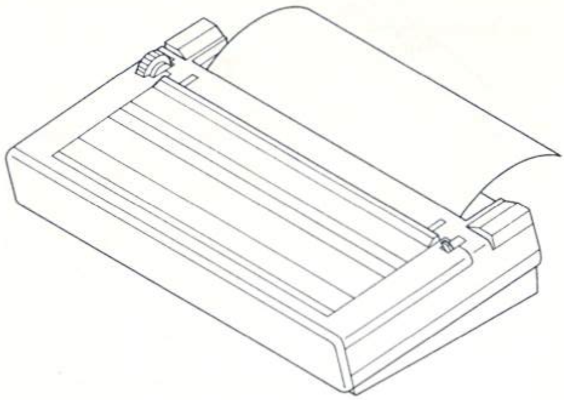


Figure 11.

d. Pull the paper release lever toward CLOSE. Turn the Paper Advance knob to feed paper back and forward, and set the paper at the print starting position.

2. Paper Loading when Optional Tractor Feed Unit is Installed

a. Push the paper release lever to the direction of OPEN (clockwise), and insert the paper into the paper slot.

b. Turn the Paper Advance Knob to the direction of arrow to advance paper until the edge comes out of window cover.

c. Move the paper release lever toward OPEN.

d. Open the tractor covers of the tractor feed unit on both sides.

e. Adjust the paper on to the feed pins of the tractor feed units on both sides. Then close the tractor covers. If the holes and the width of the paper are not aligned, shift the paper side ways until the spacing is correct. Then pull the paper from behind the printer to remove any slack.

f. Adjust printing position by turning the paper advance knob.

E. Connecting The Printer To Your Computer (See Figure 12, 13)

To connect your printer to your Commodore computer, please follow the instructions in the order listed below.

1. Make sure that both your computer and printer are turned OFF.

2. Connect one end of the 6-pin DIN cable to the connector holes located in the back of your printer at the lower left. This cable is "keyed" so that you cannot plug the cable in the wrong way. This means that the pins should be positioned so that a slight pressure will insert the cable properly. You should not have to force these pins in, and doing so could damage your cable.

3. Connect the other end of the cable to your computer in the Serial Port Connector located in the back of your computer (See Figure 12) or your Disk Drive (See Figure 13). Make sure that you are "keying" the pins properly into the connector with 6 holes.

4. Now plug the printer's power cord into a standard AC wall outlet. However, do NOT turn the equipment on yet.

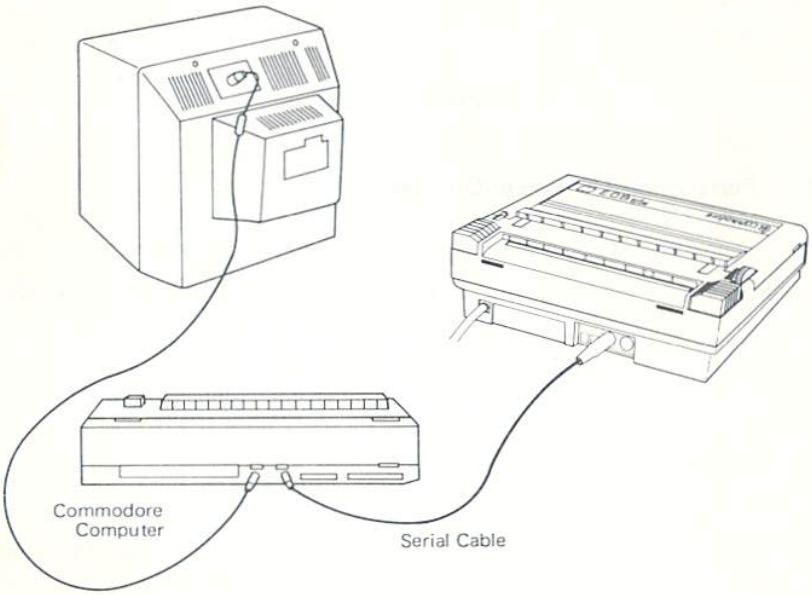


Figure 12. Printer to Computer Hookup

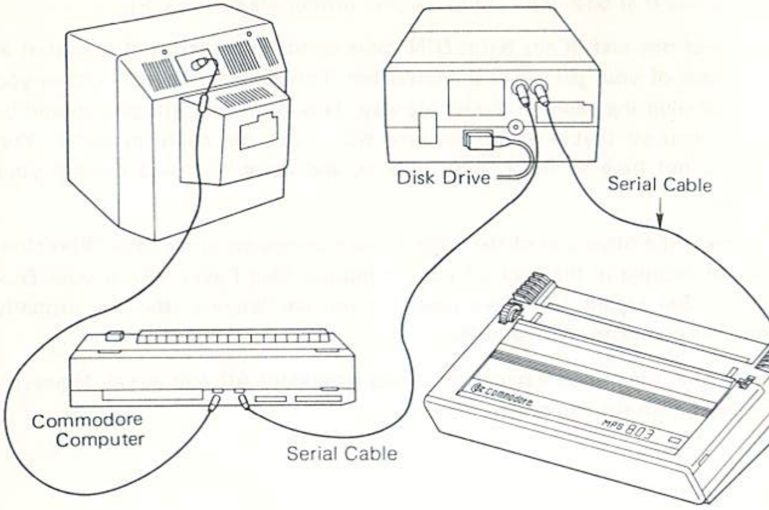


Figure 14. Multiple Hookup

F. Performing The Power-On Test

You are now ready to proceed with the power-on part of the checkout:

1. Turn on the AC power to your computer and verify that is working correctly.

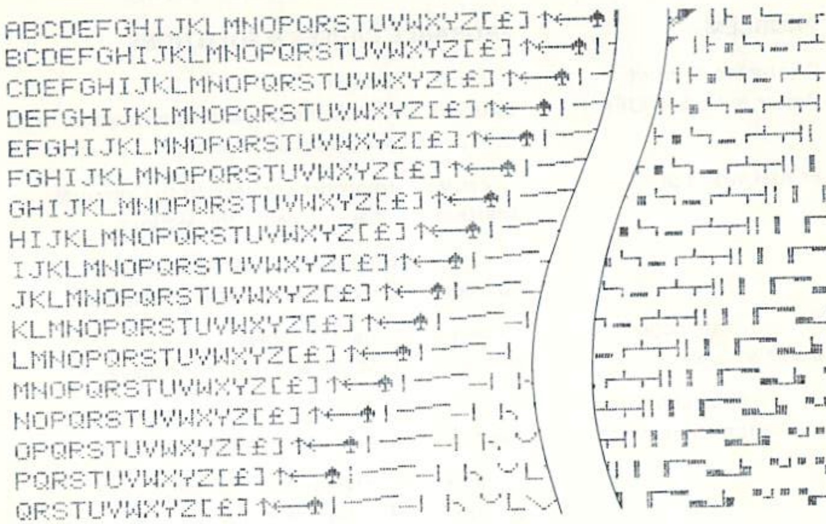
2. To turn on the power to the printer, press the rocker switch at the side of the printer so that the white dot on the switch is visible. In response to the application of AC power, POWER light in the PAPER ADVANCE switch should be lit and the printer's microprocessor should move the print head to the far left from the center position, then to the center position. If this does not happen (and that's highly unlikely), turn off both machines, check all connections and try again. If you still don't get the correct responce, contact your Commodore dealer.

G. Diagnostic Print Test

Now you can perform the diagnostic print test the print head and the ribbon cassette as well after you have inserted the paper.
NEVER allow any printing to occure when there is no paper in the printer. If the paper empty occure, the power/error indicator flashes on. Please paper install, and then press the paper advance switch, then paper empty status is recovered.

To perform the diagnostic print test, simply turn off the printer, then turn it back on while pressing the Paper Advance Switch.

NOTE: The Diagnostic Print Test is an 80 characters/line width, so user must use full size paper.



H. Trouble Shooting

We hope you don't have any problems with your Printer. Just in case you do, however, see if you can solve the problem using the table below. If you still have problems, bring the Printer into your COMMODORE dealer for repair.

PROBLEM		PROBABLE CAUSES & SOLUTIONS
Printer won't print. Power indicator 'OFF'	cause:	Printer
	solution:	Check the power line connection and the power switch.
Printer won't print	cause:	Improper connection to Computer.
	solution:	Check all cable connections.
	cause:	Improperly loaded cartridge.
	solution:	Reload and adjust the cartridge.
Printer okay, paper won't advance.	cause:	Paper is jammed.
	solution:	Remove and reload the paper.
Printed characters are too light or smudging.	cause:	Old or worn out ribbon cartridge.
	solution:	Replace the cartridge.
	cause:	Wrong cartridge setting.
	solution:	Re-adjust the cartridge.

IMPORTANT: If you try to fix internal problems yourself by working inside your printer, you will void your warranty. Take the printer to your COMMODORE dealer for any necessary repairs.

I. Cautions

1. Wait at least one minute to turn on the power after it is turned off so that the Printer will be initialized properly.
2. Never place the Printer in direct sunlight.
3. Never apply power while you are either plugging in or unplugging the serial interface connector.
4. Never turn the power off while the Printer is operating.
5. Never try to move the print head manually when the power is either on or not.
6. Never stop the ribbon cartridge motion while it is printing.
7. If a foreign object falls into the Printer, turn it off immediately and remove the object. (This situation is the only exception to item #4 above.)

CHAPTER 2
USING YOUR PRINTER

A. Introduction:

Now that you have learned how to install the ribbon cassette and paper into your new Printer, how to connect it to your computer, how to test it and how to solve any problems that may occur, you are ready for the next step – Putting the MPS-803 Printer to work with you.

In this chapter, you will see how to use your Printer to print program listing, program results, and graphic displays. Before we go any further, make sure that you are able to do the following:

1. Operate your COMMODORE computer.
2. Write elementary programs in BASIC language.
3. OPEN and CLOSE files.
4. Read and write files to various peripheral devices: (Like a DATASSETTE™ recorder or COMMODORE Floppy Disk Drive for the purpose of saving/retrieving programs keyed in as you continue through the rest of this manual.)

If you are not familiar with any of the above items, take the time now to read and understand **USER'S GUIDE** and **PROGRAMMER'S REFERENCE GUIDE.**

B. Basic Commands Associated With Your Printer

1. The OPEN Command:

This command creates a linkage or correspondence between a given physical device and a file number. Its format is as follows:

OPEN lfn, dn, sa

where:

lfn

Is the logical file number (any number from 1 to 255). If the logical file number is greater than 127, any printed lines will be double spaced.

dn

Is the device number of the peripheral that will be sending/receiving the file. For the remainder of this manual, you will be using #4, the address of your Printer. (Since that is the number assigned to it at the factory.)

NOTE: If you want to change a printer device number, you can have it changed by DIP switch (you might want to have a printer's device number changed if you have two printers attached to your computer. You need to refer to each of the individually; hence, the need to change one of the device numbers.)

---

sa

Is the secondary address, a unique way of instructing your Printer's internal microprocessor to perform certain specific tasks. More about this important feature later.

2. The PRINT# Command:

This command works just like the BASIC PRINT command except that it directs the output to the Printer instead of the video screen. The abbreviation for PRINT# is pR (unshifted p and shifted R). There must be no space before the #, and spaces after the # are ignored. The format is as follows:

PRINT# lfn <, variable/data>

where:

lfn

Is the logical file lfn nber (any number from 1 to 255). This number must correspond to a given OPEN command.

<variable/data> will be discussed in detail later in this user's guide.

3. The CLOSE Command:

Careful use of this command is important because you may only have a maximum of ten files open at any one time. Programming your Printer may require that you keep several files open simultaneously. Always close files when you are finished using them. The format is as follows:

CLOSE lfn

where:

lfn

Is the logical file number of the file being closed, this number must correspond to a given OPEN command.

4. The CMD Command:

Good programming practice dictates never using this statement within a program; use this statement in direct mode only.

This statement transfers the primary output device (TV screen) to the logical file number specified in the command. The file must have been previously OPENed.

When this command is in effect, all output generated by PRINT or LIST command will be sent to the file instead of the video monitor. The format of the command is as follows:

CMD lfn< , variable/data >

where:

lfn

Is the logical file number to receive the output.

< variable/data > (optional) when specified is sent directly to the file. This can be used as a handy way of printing titles on printouts.

To re-direct the output back to the primary output device, the PRINT# (not abbreviation) command must be used to send a blank line to the CMD device prior to closing the file. If a SYNTAX ERROR occurs, output will not be redirected back to the video monitor. Devices are not "unlistened" by this so you should PRINT# a blank line after an error condition.

5. Command Example

OPEN 1, 4, 7	File#1, device#4, secondary address#7
OPEN 2, 4	File#2, device#4 (secondary address is default #0)
PRINT#1, "HELLO THERE"	Print "HELLO THERE" on file#1
PRINT#2, ""	Print a blank line on file#2
CLOSE1: CLOSE2	Close file#1 and file#2

Remember, since CMD does not close the line to the printer, you must always precede a CLOSE command with PRINT# in order to properly close the file.

EXAMPLE:

Right	Wrong
OPEN 1, 4 PRINT#1, "HELLO THERE" CLOSE 1	
OPEN 2, 4, 7 CMD 2, "HELLO THERE" not PRINT#2 CLOSE 2	OPEN 2, 4, 7 CMD 2, "HELLO THERE" CLOSE 2
OPEN 3, 4 CMD 3, "HELLO THERE" not PRINT#3, "HELLO THERE" CLOSE 3	

OPEN 4, 4, 7	OPEN 4, 4, 7
PRINT#4, "HELLO THERE" not	PRINT#4, "HELLO THERE"
CMD 4, "HELLO THERE"	CMD 4, "HELLO THERE"
PRINT#4	CLOSE 4
CLOSE 4	

Armed with these thumbnail descriptions of what the printer related commands do, you can now proceed to the next part of this chapter, which tells you how to use these commands to control your printer.

C. Printing In The Direct Mode

Now that you have reviewed the BASIC commands you will need to handle files directed to your Printer, let's put them to use in some practical applications. The direct mode allows you to communicate with your printer by entering printing commands directly into your computer via the keyboard and having them executed immediately.

The following example illustrates the DIRECT mode procedure for listing a short BASIC program. In the example below, a single statement BASIC program is keyed into the computer's memory. A LIST command is keyed and the program is printed on your video monitor. A file (#3) is OPENed to your Printer. A CMD 3 is issued to the file open on your Printer (it is now **listening**). Issue the LIST command again. This time the output will be sent to your Printer. To **unlisten** the Printer, you instruct the computer to print a null character to file#3. Now you can CLOSE file#3, freeing up that file number for some other use. All output will now appear on the video monitor.

You Type:	The screen displays:	The Printer prints:
10 PRINT"TEST"	10 PRINT"TEST"	
LIST	LIST 10 PRINT"TEST"	
OPEN 3, 4	OPEN 3, 4 READY.	
CMD3	CMD3	READY.
LIST	LIST	10 PRINT"TEST" READY.
PRINT#3	PRINT#3 READY.	
CLOSE3	CLOSE3 READY.	

Program List

Program LISTing is the most important job of the printer. To get a program list, follow the procedure below.

1. Program List in Graphic Mode

OPEN 4, 4: CMD4: LIST
Simple Listing

OPEN 4, 4: CMD4: LIST 100-500
Simple Listing Line No. 100-500

OPEN 4,4: CMD4, "PROGRAM NAME": LIST
Print the Program Name and Listing

OPEN 4, 4: CMD4, CHR$(14); "PROGRAM NAME": LIST
Print the Program Name and Listing in enhance character

OPEN 4, 4: CMD4, CHR$(14); "PROGRAM NAME"; CHR$(15): LIST
Print the Program Name in enhance character and Listing in standard character

NOTE: Control Character CHR$(14), CHR$(15) are used in above procedure. You may find out more about these on Chapter 2 Part F.

After getting the PROGRAM LIST, enter the following:

PRINT#4

CLOSE4

2. To get Program List in Business Mode, you should add the secondary address of 7 to the OPEN Statement.

OPEN 7, 4, 7: CMD7: LIST
Simple Listing

OPEN 7, 4, 7: CMD7: LIST 100-500
Simple Listing Line No. 100-500

OPEN 7, 4, 7: CMD7, "PROGRAM NAME" LIST
Print the Program Name and Listing

OPEN 7, 4, 7: CMD7, CHR$(14); "PROGRAM NAME": LIST
Print the Program Name and Listing in enhance character

OPEN 7, 4, 7: CMD7, CHR$(14); "PROGRAM NAME"; CHR$(15): LIST
Print the Program Name in enhance character and Listing standard character

After getting the PROGRAM LIST, enter the following

PRINT#7

CLOSE7

D. Printing Under Program Control

You have seen how to print a listing of a simple BASIC program directly from the keyboard. Although it is not good programming practice, the following example shows how to print a listing of a BASIC program under control of the program itself. First, enter the following simple program into your computer's memory:

```
10 OPEN 3, 4
20 CMD3
30 PRINT "PROGRAM CONTROL"
40 LIST
```

If you typed List on your keyboard, the program you just entered would be listed on your video monitor. Enter the RUN command. The following should be printed on your Printer:

```
PROGRAM CONTROL

10 OPEN 3, 4
20 CMD3
30 PRINT "PROGRAM CONTROL"
40 LIST

READY.
```

Now, enter the following

```
PRINT#3     (Unlisten the channel)
CLOSE3      (Close the channel)
```

The RUN command instructed the computer to execute the program in its memory. First, file#3 (device#4) was opened. Next, the CMD command instructed the computer to direct all subsequent output to file#3. The program then PRINTed **PROGRAM CONTROL** on file #3. The LIST command instructed the computer to print a listing of the program in its memory on file#3.

REMEMBER – when using the LIST command within a program, you must type the **PRINT# lfn** command to **unlisten** the printer. Then you must type in the **CLOSE lfn** command to close the file. Both of these commands can be entered into the program or after you have RUN the Program. Using the LIST command or the CMD command in a program is generally not a good programming practice. It is suggested that you only use them in DIRECT mode.

E. Secondary Address

Earlier in this guide, you were introduced to the secondary address concept in the discussion of the OPEN statement. This unique feature allows you to instruct your new Printer to do following operations:

OPERATIONS	Secondary Address
Print in Graphic Mode	0 (default)
Print in Business Mode	7

1. SA=0: Printing in Graphic Mode

This secondary address causes the Printer to print ASCII data in Graphic (Upper-case/Graphic character) mode. As mentioned before, this secondary address is the default value and need not be coded.

The format for this command is as follows:

```
OPEN 4, 4        (OPEN 4, 4, 0)
PRINT#4 <, variable/data >
CLOSE 4
```

Try the following sample programs:

The first program will print three types of print in Graphic mode on your Printer.

EXAMPLE 1:

```
100 REM SA=0...PRINTING IN GRAPHIC MODE
110 OPEN4,4    :REM OPEN4,4,0
120 PRINT#4,"SECONDARY ADDRESS 0"
130 A$="PRINTING IN GRAPHIC MODE"
140 PRINT#4,A$
150 PRINT#4,123456789
160 FOR I=64 TO 95
170 PRINT#4,CHR$(I);
180 NEXT I
190 FOR J=1 TO 8:PRINT#4:NEXT J
200 CLOSE4
```

RUN

```
SECONDARY ADDRESS 0
PRINTING IN GRAPHIC MODE
 123456789
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
```

The second sample program will print ASCII code table in Graphic Mode. The ASCII $00–$1F and $80–$9F are special control characters, so this code table won't print these codes.

EXAMPLE 2:

```
100 REM SA=0...PRINTING IN GRAPHIC MODE
110 OPEN 4,4   :REM OPEN 4,4,0
120 SP$=" "
130 A$="0123456789ABCDEF"
140 PRINT#4,SP$;SP$;
150 FOR I=0 TO 15
160 PRINT#4,MID$(A$,I+1,1);SP$;
170 NEXT I
180 PRINT#4
190 :
200 FOR J=0 TO 15
210 PRINT#4,MID$(A$,J+1,1);SP$;
220 PRINT#4,SP$;SP$;SP$;SP$;
230 PRINT#4,CHR$(J+32);SP$;CHR$(J+48);SP$;
240 PRINT#4,CHR$(J+64);SP$;CHR$(J+80);SP$;
250 PRINT#4,CHR$(J+96);SP$;CHR$(J+112);SP$;
260 PRINT#4,SP$;SP$;SP$;SP$;
270 PRINT#4,CHR$(J+160);SP$;CHR$(J+176);SP$;
280 PRINT#4,CHR$(J+192);SP$;CHR$(J+208);SP$;
290 PRINT#4,CHR$(J+224);SP$;CHR$(J+240)
300 NEXT J
310 FOR K=1 TO 8:PRINT#4:NEXT K
320 CLOSE4
```

RUN



2. SA=7: Printing in Business Mode

To change the printer to print on Business (Lower/Upper-Case Character) Mode, you must open the printer file on SA=7:

The format for this command is as follows:

OPEN 7, 4, 7
PRINT#7 <, variable/data>
CLOSE 7

Try the following sample programs:

The first program will print three types of print in Business mode on your Printer.

EXAMPLE 1:

```
100 rem sa=7...printing in business mode
110 open 7,4,7
120 print#7,"Secondary Address 7"
130 a$="Printing in Business Mode"
140 print#7,a$
150 print#7,123456789
160 for i=64 to 95
170 print#7,chr$(i);
180 next i
190 print#7
200 for j=1 to 8:print#7:next j
210 close7
```

RUN

```
Secondary Address 7
Printing in Business Mode
 123456789
@abcdefghijklmnopqrstuvwxyz[£]↑←
```

The second sample program will print ASCII code table in Business Mode. The ASCII $00–$1F and $80–$9F are special control characters, so this code table won't print these codes.

EXAMPLE 2:

```
100 rem sa=7...printing in business mode
110 open 7,4,7
120 sp$=" "
```

```
130 a$="0123456789abcdef"
140 print#7,sp$;sp$;
150 for i=0 to 15
160 print#7,mid$(a$,i+1,1);sp$;
170 next i
180 print#7
190 :
200 for j=0 to 15
210 print#7,mid$(a$,j+1,1);sp$;
220 print#7,sp$;sp$;sp$;sp$;
230 print#7,chr$(j+32);sp$;chr$(j+48);sp$;
240 print#7,chr$(j+64);sp$;chr$(j+80);sp$;
250 print#7,chr$(j+96);sp$;chr$(j+112);sp$;
260 print#7,sp$;sp$;sp$;sp$;
270 print#7,chr$(j+160);sp$;chr$(j+176);sp$;
280 print#7,chr$(j+192);sp$;chr$(j+208);sp$;
290 print#7,chr$(j+224);sp$;chr$(j+240)
300 next j
310 for k=1 to 7:print#7:next k
320 close7
```

RUN

```
  0 1 2 3 4 5 6 7 8 9 a b c d e f
0       0 @ p ─ P       ┌ ─ P   ┌
1     ! 1 a q A Q     ▌ ┴ A Q ▌ ┴
2     " 2 b r B R     ▄ ┬ B R ▄ ┬
3     # 3 c s C S     ▔ ┤ C S ▔ ┤
4     $ 4 d t D T     ▁ ▏ D T ▁ ▏
5     % 5 e u E U     ▏ ▎ E U ▏ ▎
6     & 6 f v F V     ▒ ▐ F V ▒ ▐
7     ' 7 g w G W     ▕ ▔ G W ▕ ▔
8     ( 8 h x H X     ▒ ▀ H X ▒ ▀
9     ) 9 i y I Y     ▒ ▂ I Y ▒ ▂
a     * : j z J Z     ▕ ◣ J Z ▕ ◣
b     + ; k [ K ┼     ├ ▗ K ┼ ├ ▗
c     , < l £ L ▒     ▖ ▝ L ▒ ▖ ▝
d     - = m ] M │     └ ┘ M │ └ ┘
e     . > n ↑ N ▚     ┐ ▘ N ▚ ┐ ▘
f     / ? o ← O ▒     ▂ ▚ O ▒ ▂ ▚
```

F. Special Control Character Functions

Special control characters can be used to change the mode of printing (Table 1 contains a summary of the special control characters). Printer control characters are inserted in the data stream transmitted to the printer via secondary address 0 or 7.

TABLE 1
Special Control Character Summary

Printer function	CHR$ Code
Enhance ON	CHR$(14)
Enhance OFF	CHR$(15)
Bit Image Printing	CHR$(8)
Reverse ON	CHR$(18)
Reverse OFF	CHR$(146)
Carriage Return	CHR$(13)
Line Feed	CHR$(10)
Print in Business Mode	CHR$(17)
Print in Graphic Mode	CHR$(145)
Quote	CHR$(34)
Tab Setting the Print Head	CHR$(16); "nHnL"
Repeat Graphic Selected	CHR$(26); CHR$(bit image data)
Specify Dot Address	CHR$(27); CHR$(16); CHR$(nH)CHR$(nL)

1. Enhance ON/OFF CHR$(14)/CHR$(15)

Your printer normally generates a character using dot matrix that is 7 dots high and 6 dots wide. If you send an ASCII CHR$(14) character within a data output PRINT# statements parameter, all characters following the CHR$(14) are printed double-width using dot matrix that is 7 dots high and 12 dots wide.

An ASCII CHR$(15) character cancels the character enhancement specified by preceding CHR$(14) character or ASCII CHR$(15) is Standard Character Mode.

CHR$(14) and CHR$(15) cancel later mentioned bit image graphic printing code [CHR$(8)]. And these control codes give a 1/6 inch line feed.

The example below shows Enhance ON/OFF functions.

EXAMPLE 1:

```
100 REM CHR$(14)...ENHANCE ON/DOUBLE WIDTH CHR
110 REM CHR$(15)...ENHANCE OFF/STD WIDTH CHR
120 OPEN 4,4 :REM PRINT IN GRAPHIC MODE
130 EN$=CHR$(14):DE$=CHR$(15)
140 FOR I=1 TO 4
150 PRINT#4,EN$;"ENHANCE ON";
160 PRINT#4,DE$;"    ENHANCE OFF"
170 NEXT I
180 :
190 FOR J=1 TO 8:PRINT#4:NEXT J
200 CLOSE4
```

RUN

```
ENHANCE ON    ENHANCE OFF
ENHANCE ON    ENHANCE OFF
ENHANCE ON    ENHANCE OFF
ENHANCE ON    ENHANCE OFF
```

EXAMPLE 2:

```
100 REM CHR$(14)...ENHANCE ON/DOUBLE WIDTH CHR
110 REM CHR$(15)...ENHANCE OFF/STD WIDTH CHR
120 OPEN 4,4 :REM PRINT IN GRAPHIC MODE
130 EN$=CHR$(14):DE$=CHR$(15)
140 FOR I=1 TO 4
150 PRINT#4,EN$;"ENHANCE ON"
155 PRINT#4,EN$;"ENHANCE CONTINUE"
160 PRINT#4,DE$;"ENHANCE OFF"
```

```
170 NEXT I
180 :
190 FOR J=1 TO 8:PRINT#4:NEXT J
200 CLOSE4
```

RUN

```
ENHANCE ON
ENHANCE CONTINUE
ENHANCE OFF
ENHANCE ON
ENHANCE CONTINUE
ENHANCE OFF
ENHANCE ON
ENHANCE CONTINUE
ENHANCE OFF
ENHANCE ON
ENHANCE CONTINUE
ENHANCE OFF
```

2. Bit Image Printing Mode CHR$(8)

By using CHR$(8) you enter the Bit Image Printing Mode. This allows you to design and print bit image graphics by inputting bit image data. Each DATA statement is made of numbers that represent a row of dots which, when READ all together, will make up your bit image graphic. To design your bit image graphic, follow the example below. You should notice that each number in the DATA statement corresponds to 1 row in your bit image graphic. To design a graphic, follow these steps:

1. Get a separate piece of paper to design your bit image graphic.
2. Number 7 consecutive rows like this:

   1
   2
   4
   8
   16
   32
   64

3. Now design your bit image graphic in dot form (see the example below).
4. Add together all the numbers from the column on the left, only wherever you have placed a dot in a row. In this example, the first column has 3 dots located in row 8, 16. Added together they equal 24.

5. Now add 128 to total you had for each column in step 4. In our example we add 128 to 24 for a total of 152.

6. Put your final total for each column into a data statement in column order.

1	○	○	○	○	○	○	●	●	○	○	○	○	○	○	○	○
2	○	○	●	●	●	●	●	●	●	●	●	●	○	○	○	○
4	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○
8	●	●	●	●	○	○	●	●	○	○	●	●	●	●	○	○
16	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○
32	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○
64	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○
+128	152	152	254	254	146	146	255	255	146	146	254	254	152	152	128	128

The DATA statement in your program will read:

DATA 152, 152, 254, 254, 146, 146, 255, 255
DATA 146, 146, 254, 254, 152, 152, 128, 128

The following program will print a Flying object 5 times.

```
100 REM CHR$(8)...BIT IMAGE GRAPHIC PRINTING
110 OPEN 4,4    :REM PRINT IN GRAPHIC MODE
120 BS$=CHR$(8):DE$=CHR$(15)
130 :
140 A$=""
150 FOR I=1 TO 16
160 READ A: A$=A$+CHR$(A)
170 NEXT I
180 :
190 FOR J=1 TO 5
200 PRINT#4,BS$;A$;DE$
210 NEXT J
220 :
230 FOR K=1 TO 8:PRINT#4:NEXT K
240 CLOSE4
250 END
260 :
270 DATA 152,152,254,254,146,146,255,255
280 DATA 146,146,254,254,152,152,128,128
```

(DE$ in line 200:) This control code define 1/6" line feed (separate printed line)

After typing RUN, you get the result below:



This program shows all bit pattern printing.

EXAMPLE 2:

```
100 REM CHR$(8)...BIT IMAGE GRAPHIC PRINTING
110 OPEN 4,4     :REM PRINT IN GRAPHIC MODE
120 BS$=CHR$(8):DE$=CHR$(15)
130 :
140 A$=""
150 FOR I=0 TO 127
160 A$=A$+CHR$(I+127)
170 NEXT I
180 B$=""
190 FOR J=127 TO 0 STEP-1
200 B$=B$+CHR$(J+127)
210 NEXT J
220 :
230 FOR K=1 TO 3
240 PRINT#4,BS$;A$;DE$;"  ALL BIT PATTERN 1"
250 NEXT K
260 PRINT#4
270 FOR K=1 TO 3
280 PRINT#4,BS$;B$;DE$;"  ALL BIT PATTERN 2"
290 NEXT K
300 :
310 FOR M=1 TO 8:PRINT#4:NEXT M
320 CLOSE4
```

After typing RUN, you get the result below.



```
ALL BIT PATTERN 1
ALL BIT PATTERN 1
ALL BIT PATTERN 1

ALL BIT PATTERN 2
ALL BIT PATTERN 2
ALL BIT PATTERN 2
```

Next Program prints out a bit image graphic .

```
100 REM CHR$(8)...BIT IMAGE GRAPHIC PRINTING
110 OPEN 4,4       :REM PRINT IN GRAPHIC MODE
120 BS$=CHR$(8):DE$=CHR$(15)
130 :
140 FOR ROW=1 TO 3
150 FOR COLUMN=1 TO 16
160 READ A: A$(ROW)=A$(ROW)+CHR$(A)
170 NEXT COLUMN
180 NEXT ROW
190 :
200 PRINT#4,BS$;
210 FOR ROW=1 TO 3
220 PRINT#4,A$(ROW)
230 NEXT ROW
240 PRINT#4,DE$
250 :
260 FOR L=1 TO 8:PRINT#4:NEXT L
270 CLOSE4
280 END
290 :
300 DATA 129,129,250,250,158,158,255,255
310 DATA 158,158,250,250,129,129,128,128
320 DATA 128,128,159,159,243,243,179,179
330 DATA 243,243,159,159,128,128,128,128
340 DATA 128,128,130,130,131,131,128,128
350 DATA 131,131,130,130,128,128,128,128
```

RUN



(← continuous print lines)

Next example is to print signs of the zodiac by bit image graphic printing. Signs are not exactly clear because they consists of 7 (vertical) x 5 (horizontal) dots.

```
100 rem chr$(8)...bit image graphic printing
110 open 7,4,7     :rem print in business mode
120 bs$=chr$(8):de$=chr$(15)
130 :
140 dim a$(12),b$(12)
150 for i=1 to 12
160 for j=1 to 6
```

```
170 read a: a$(i)=a$(i)+chr$(a)
180 next j
190 read b$:b$(i)=left$(b$+"           ",11)
200 next i
210 :
220 for k=1 to 6
230 print#7,bs$;a$(k);de$;" ";b$(k);
240 print#7,"       ";
250 print#7,bs$;a$(k+6);de$;" ";b$(k+6);
255 print#7
260 next k
270 :
280 for l=1 to 8:print#7:next l
290 close4
300 end
310 :
320 data 130,129,254,129,130,128,"Aries"
330 data 189,194,194,194,189,128,"Taurus"
340 data 227,221,193,193,221,227,"Gemini"
350 data 156,154,130,192,216,184,"Cancer"
360 data 136,148,142,129,190,192,"Leo"
370 data 255,129,254,193,254,152,"Virgo"
380 data 214,217,193,217,214,128,"Libra"
390 data 255,129,254,129,254,184,"Scorpio"
400 data 192,168,144,170,134,142,"Sagittarius"
410 data 143,240,143,194,188,140,"Capricornus"
420 data 164,200,164,200,164,128,"Aquarius"
430 data 201,190,136,136,190,201,"Pisces"
```

RUN

```
♈ Aries          ♎ Libra
♉ Taurus         ♏ Scorpio
♊ Gemini         ♐ Sagittarius
♋ Cancer         ♑ Capricornus
♌ Leo            ♒ Aquarius
♍ Virgo          ♓ Pisces
```

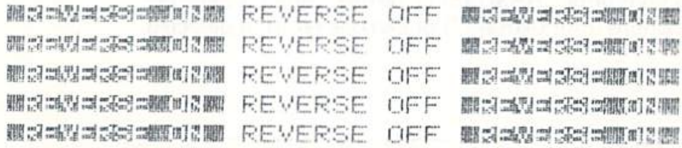
3. Reverse ON/OFF CHR$(18)/CHR$(146)

By sending the code [CHR$(18)] to your printer, you have turned on the REVERSE FIELD mode. This prints white letters on a black background. By sending the code [CHR$(146)] to your printer turns off the REVERSE FIELD mode.

EXAMPLE 1:

```
100 REM CHR$(18) ...REVERSE ON
110 REM CHR$(146)...REVERSE OFF
120 RV$=CHR$(18):RO$=CHR$(146)
130 A$=" REVERSE ON ":B$=" REVERSE OFF "
140 :
150 OPEN 4,4  :REM PRINT IN GRAPHIC MODE
160 FOR I=1 TO 5
170 PRINT#4,RV$;A$;RO$;B$;RV$;A$
180 NEXT I
190 :
200 FOR J=1 TO 8:PRINT#4:NEXT J
210 CLOSE4
```

RUN



EXAMPLE 2:

```
100 rem "▓" : chr$(18) ...reverse on
110 rem "▓" : chr$(146)...reverse off
120 :
130 open 7,4,7:rem print in business mode
140 for i=1 to 5
150 print#7,"▓ Reverse on ";"▓ Reverse off ";
160 print#7,"▓ Reverse on "
170 next i
180 :
190 for j=1 to 8:print#7:next j
200 close7
```

CTRL RVS ON — CTRL RVS OFF

run

```
 Reverse on  Reverse off  Reverse on 
 Reverse on  Reverse off  Reverse on 
 Reverse on  Reverse off  Reverse on 
 Reverse on  Reverse off  Reverse on 
 Reverse on  Reverse off  Reverse on 
```

4. Selecting Character Mode In Local CHR$(17)/CHR$(145)

Secondary addresses 0 and 7 set a character mode in global (SA=0: Graphic Mode, SA=7: Business Mode), where as control codes CHR$(17) [cursor down] and CHR$(145) [cursor up] set a character mode in local . . . CHR$(17): Business Mode, CHR$(145): Graphic Mode. Through these two control codes, the printer can produce two kinds of character set, both in graphic mode and in business mode, mixed on one line, that cannot show on screen.

CHR$(17) functions until CHR$(145) or carriage return is detected.
CHR$(145) functions until CHR$(17) or carriage return is detected.

EXAMPLE 1:

```
100 REM CHR$(17) ...LOCAL BUSINESS MODE
110 REM CHR$(145)...LOCAL GRAPHIC MODE
120 CD$=CHR$(17):CU$=CHR$(145)
130 :
140 OPEN 7,4,7 :REM PRINT IN BUSINESS MODE
150 PRINT#7,CU$;"♠          ";CD$;"SPADE"
160 PRINT#7,CU$;"♥          ";CD$;"HEART"
170 PRINT#7,CU$;"♦          ";CD$;"DIAMOND"
180 PRINT#7,CU$;"♣          ";CD$;"CLUB"
190 PRINT#7:PRINT#7
200 CLOSE7
210 :
220 OPEN 4,4,0 :REM PRINT IN GRAPHIC MODE
230 PRINT#4,CD$;"SPADE    ";CU$;"♠"
240 PRINT#4,CD$;"HEART    ";CU$;"♥"
250 PRINT#4,CD$;"DIAMOND  ";CU$;"♦"
260 PRINT#4,CD$;"CLUB     ";CU$;"♣"
270 PRINT#4:PRINT#4
280 CLOSE4
290 :
300 OPEN 7,4,7
310 FOR I=1 TO 8:PRINT#7:NEXT I
320 CLOSE7
```

RUN

```
♠        spade
♥        heart
♦        diamond
♣        club


spade    ♠
heart    ♥
diamond  ♦
club     ♣
```

EXAMPLE 2:

```
100 rem "▮":chr$(17) ...local business mode
110 rem "▮":chr$(145)...local graphic mode
120 :
130 open 7,4,7  :rem print in business mode
140 print#7,"LOGO  M  ▮|  ▮8/8 Vertical"
150 print#7,"SHIFT Y  ▮Y  ▮7/8 Vertical"
160 print#7,"SHIFT H  ▮H  ▮6/8 Vertical"
170 print#7,"SHIFT |  ▮|  ▮5/8 Vertical"
180 print#7,"SHIFT B  ▮B  ▮4/8 Vertical"
190 print#7,"SHIFT G  ▮G  ▮3/8 Vertical"
200 print#7,"SHIFT T  ▮T  ▮2/8 Vertical"
210 print#7,"LOGO  G  ▮   ▮1/8 Vertical"
220 :
230 for i=1 to 8:print#7:next i
240 close7
```

run

```
LOGO  M  |  8/8 Vertical
SHIFT Y  |  7/8 Vertical
SHIFT H  |  6/8 Vertical
SHIFT |  |  5/8 Vertical
SHIFT B  |  4/8 Vertical
SHIFT G  |  3/8 Vertical
SHIFT T  |  2/8 Vertical
LOGO  G  |  1/8 Vertical
```

5. Print Position Determination CHR$(16); ''nHnL''

With the POS Code [CHR$(16)] you can determine the print start position. This is done by assigning a 2-digit number following the CHR$(16) (see the examples below).

EXAMPLE 1:

```
100 REM CHR$(16)...SET PRINT POSITION
110 :
120 OPEN 4,4     :REM PRINT IN GRAPHIC MODE
130 PO$=CHR$(16)
140 FOR I=1 TO 4
150 PRINT#4,"0123456789";
160 NEXT I
170 PRINT#4
180 PRINT#4,PO$;"08";"COMMODORE";
190 PRINT#4,PO$;"30";"PRINTER";
200 :
210 FOR J=1 TO 8:PRINT#4:NEXT J
220 CLOSE4
```

RUN

```
0123456789012345678901234567890123456789
        COMMODORE                     PRINTER
```

The two numbers following the CHR$(16) codes are the print start position of your standard characters. This can be proven using the following example.

EXAMPLE 2:

```
100 REM CHR$(16)...SET PRINT POSITION
110 :
120 OPEN 4,4     :REM PRINT IN GRAPHIC MODE
130 PO$=CHR$(16):EN$=CHR$(14):DE$=CHR$(15)
140 FOR I=1 TO 4
150 PRINT#4,"0123456789";
160 NEXT I
170 PRINT#4
175 PRINT#4,EN$;
180 PRINT#4,PO$;"08";"COMMODORE";
190 PRINT#4,PO$;"30";"PRINTER";
195 PRINT#4,DE$;
200 :
```

```
210 FOR J=1 TO 8:PRINT#4:NEXT J
220 CLOSE4
```

RUN

```
0123456789012345678901234567890123456789
        COMMODORE    PRINTER
```

6. Repeat Bit Image Printing

CHR(8) . . . . . CHR$(26); CHR$(n); CHR$(Bit Image Data)

This codes sequence specifies the repeated printing of bit image data. "n" is a binary number (0 through 255) which specifies the desired number of the printed repetition; followed by one-byte bit image data to be printing repeatedly.

When 0 is specified for "n", it is read as 256. In order to repeat more than 256 times the operator needs to use this code twice.

EXAMPLE:

```
100 REM REPETITION OF BIT PATTERN
110 OPEN 4,4  :REM PRINT IN GRAPHIC MODE
120 BS$=CHR$(8):SUB$=CHR$(26):DE$=CHR$(15)
130 FOR I=1 TO 6
140 READ N
150 PRINT#4,BS$;SUB$;CHR$(N);CHR$(243);DE$
160 NEXT I
170 :
180 FOR J=1 TO 8:PRINT#4:NEXT J
190 CLOSE4
200 :
210 DATA 34,57,75,89,123,186
```

RUN



7. Dot Address Determination
CHR$(27); CHR$(16); CHR$(nH); CHR$(nL)

ESC	POS	nH	nL
CHR$(27)	CHR$(16)	CHR$(nH)	CHR$(nL)

This code sequence specifies print start position in dot units. nH and nL are 2-byte binary numbers (0 through 639) which indicate dots where printing starts. When a number greater than 639 is specified, the dot is printed from the beginning of the next line.

D8	D7	65	D5	D4	D3	D2	D1	
0	0	0	0	0	0	P10	P9	higher 2 bits
P8	P7	P6	P5	P4	P3	P2	P1	lower 8 bits

Desired number of print start positions can be specified. If a print start position is specified at a dot where other data is to be printed overstrike takes place.

EXAMPLE:

```
100 REM DOT POSITION SET
110 OPEN 4,4  :REM PRINT IN GRAPHIC MODE
120 PO$=CHR$(16):ESC$=CHR$(27)
130 :
140 FOR I=1 TO 4
150 PRINT#4,"1234567890";
160 NEXT I
170 PRINT#4
180 :
190 N=87
200 FOR J=1 TO 8
210 N=N+1
220 NH=INT(N/256):NL=N-NH*256
230 PRINT#4,ESC$;PO$;CHR$(NH)CHR$(NL);
235 PRINT#4,"DOT ADDRESS"
240 NEXT J
250 :
260 FOR K=1 TO 8:PRINT#4:NEXT K
270 CLOSE4
```

RUN

```
1234567890123456789012345678901234567890
                   DOT ADDRESS
                    DOT ADDRESS
                     DOT ADDRESS
                      DOT ADDRESS
                       DOT ADDRESS
                        DOT ADDRESS
                         DOT ADDRESS
                          DOT ADDRESS
```

EXAMPLE 2:

```
100 REM DOT POSITION SET...SIN CURVE
110 OPEN4,4   :REM PRINT IN GRAPHIC MODE
120 PO$=CHR$(16):ESC$=CHR$(27)
130 EN$=CHR$(14):DE$=CHR$(15)
140 :
150 CN=23:AM=16:OF=4
160 A$="-":FOR I=0 TO CN+AM:A$=A$+"-":NEXT I
170 SP$="                                        "
180 PRINT#4,EN$;"         SIN CURVE";DE$
190 PRINT#4
200 PRINT#4,LEFT$(SP$,OF-1);"X";
210 PRINT#4,LEFT$(SP$,CN-AM-OF-1);"-1";
220 PRINT#4,LEFT$(SP$,AM-1);"0";
230 PRINT#4,LEFT$(SP$,AM-1);"1"
240 PRINT#4,A$
250 :
260 FOR J=0 TO 360 STEP 10
270 I$=RIGHT$(SP$+STR$(J),OF)
280 YO=CN*6+AM*6*SIN(J*π/180)
290 YH=INT(YO/256):YL=YO-YH*256
300 PRINT#4,I$;              :REM SCALE
310 PRINT#4,ESC$;PO$;CHR$(YH)CHR$(YL);"*"
320 NEXT J
330 :
340 FOR K=1 TO 8:PRINT#4:NEXT K
350 CLOSE4
```

RUN

```
           SIN CURVE

   X  -1               0               1
----------------------------------------
   0                   *
  10                      *
  20                        *
  30                           *
  40                             *
  50                               *
  60                                 *
  70                                  *
  80                                   *
  90                                   *
 100                                   *
 110                                  *
 120                                 *
 130                               *
 140                             *
 150                           *
 160                        *
 170                      *
 180                   *
 190                *
 200              *
 210           *
 220         *
 230       *
 240     *
 250    *
 260   *
 270   *
 280   *
 290    *
 300     *
 310       *
 320         *
 330           *
 340              *
 350                *
 360                   *
```

8. Line Feed/Carriage Return CHR$(10)/CHR$(13)

By sending LF Code [CHR$(10)] to your printer, all data in the print buffer is printed and the paper is advanced one line.

By sending CR Code [CHR$(13)] to your printer, all data in the print buffer is printed and the paper is advanced one line.

A Carriage Return turns off REVERSE FIELD and quote mode.

EXAMPLE 1:

```
100 REM CHR$(10) ...LINE FEED
110 REM          WITH CARRIAGE RETURN
120 REM CHR$(13) ...CARRIAGE RETURN
130 REM          WITH LINE FEED
160 LF$=CHR$(10):CR$=CHR$(13)
170 :
180 OPEN 4,4  :REM PRINT IN GRAPHIC MODE
200 :
210 FOR I=1 TO 3
230 PRINT#4,"CHR$(10) ...LINE FEED ";
240 PRINT#4,"(WITH CARRIAGE RETURN)";LF$;
250 NEXT I
260 PRINT#4
300 FOR J=1 TO 3
320 PRINT#4,"CHR$(13) ...CARRIAGE RETURN ";
330 PRINT#4,"(WITH LINE FEED)";CR$;
340 NEXT J
380 :
480 FOR K=1 TO 8:PRINT#4:NEXT K
490 CLOSE4
```

RUN

```
CHR$(10) ...LINE FEED (WITH CARRIAGE RETURN)
CHR$(10) ...LINE FEED (WITH CARRIAGE RETURN)
CHR$(10) ...LINE FEED (WITH CARRIAGE RETURN)

CHR$(13) ...CARRIAGE RETURN (WITH LINE FEED)
CHR$(13) ...CARRIAGE RETURN (WITH LINE FEED)
CHR$(13) ...CARRIAGE RETURN (WITH LINE FEED)
```

AUTOMATIC PRINTING

Automatic printing will occur under 3 conditions. In order to understand ex-

actly what's happening, you have to have a little knowledge about how your printer works. First, each printed character is made from 6 rows of dots. Next, you can have up to 80 characters per printed line (spaces count as 6 dots positions just like letters and numbers). This means that there are a total of 480 dots per line. Now you're ready for the 3 conditions.

a. When the buffer fills up during the input of data.

b. When your printer "sees" that you have used up more than the 480 dots per line that was described above.

c. When both a and b happen at the same time.

What will happen when these conditions occur?

a. When the buffer fills during printing, it prints out everthing it has been storing onto your paper. But . . . it remembers where it stopped printing so that it can continue from that point, when and if you want to. Or, it will print again when you want to. Or it will print again when you fill the buffer again.

b. When the printer uses up more than 480 dots, then it prints out the line and then stops and tells you that it's READY for more information.

c. When both a and b occur, your printer will "dump" only the first 80 characters and print them. Then it will move to the next line. At this point, the printer will do two things: 1) It will hold any characters that have been left in the buffer and add to them; 2) It will give you a READY for more information statement.

EXAMPLE:

```
100 REM AUTO CARRIAGE RETURN
110 OPEN4,4   :REM PRINT IN GRAPHIC MODE
120 A$="1234567890":B$="":C$="COMMODORE"
130 FOR I=1 TO 8
140 PRINT#4,"               ";MID$(A$,I,1);
150 NEXT I
160 PRINT#4
170 FOR J=1 TO 8
180 PRINT#4,A$;
190 NEXT J
200 PRINT#4
210 :
220 FOR K=1 TO 12
230 B$=B$+C$
240 PRINT#4,B$
250 NEXT K
```

```
260 :
270 FOR K=1 TO 8:PRINT#4:NEXT K
280 CLOSE4
```

RUN

```
          1         2         3   /   7         8
123456789012345678901234567890  /  890123456789 0
COMMODORE
COMMODORECOMMODORE
COMMODORECOMMODORECOMMODORE
COMMODORECOMMODORECOMMODORECO
COMMODORECOMMODORECOMMODORECO
COMMODORECOMMODORECOMMODORECOM
COMMODORECOMMODORECOMMODORECOMM
COMMODORECOMMODORECOMMODORECOMM     DORE
COMMODORECOMMODORECOMMODORECOMMO     ORECOMMODOR
E
COMMODORECOMMODORECOMMODORECOMMOD     ORECOMMODOR
ECOMMODORE
COMMODORECOMMODORECOMMODORECOMMOD     ORECOMMODOR
ECOMMODORECOMMODORE
COMMODORECOMMODORECOMMODORECOMMO     ORECOMMODOR
ECOMMODORECOMMODORECOMMODORE
```

9. Mixture of Various Print Mode

You can use the following example to get an idea as to how to combine more than on print mode, even in one line.

EXAMPLE:

```
100 REM MIXTURE OF VARIOUS PRINT MODE
110 DATA 156,162,193,193,182,162
120 FOR I=1 TO 6:READ A:A$=A$+CHR$(A):NEXT I
130 :
140 OPEN 4,4   :REM PRINT IN GRAPHIC MODE
150 BS$=CHR$(8):ESC$=CHR$(27):
160 PO$=CHR$(16):SUB$=CHR$(26)
170 EN$=CHR$(14):DE$=CHR$(15)
175 CO$=" COMMODORE "
180 :
190 PRINT#4,BS$;SUB$;CHR$(20)CHR$(153);
200 PRINT#4,DE$;PO$;"03";CO$;
210 PRINT#4,BS$;ESC$;PO$;CHR$(0)CHR$(89);
A$;EN$;CO$;
```

```
220 PRINT#4,BS$;SUB$;CHR$(20)CHR$(153);DE$
230 :
240 FOR I=1 TO 8:PRINT#4:NEXT I
250 CLOSE4
```

RUN

== COMMODORE C COMMODORE ==

10. Line Feed Spacing

Line Feeds are executed in accordance with the print mode in effect just prior to the execution of a print command.

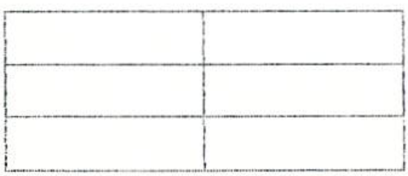
* Character and double width character modes . . . . 6 LPI
* Bit Image Graphic Print mode . . . . 9 LPI

LPI = (Line per Inch)

EXAMPLE

```
100 REM LINE FEED SPACING
110 OPEN 4,4    :REM PRINT IN GRAPHIC MODE
120 DE$=CHR$(15):BS$=CHR$(8)
130 :
140 PRINT#4,DE$;"┌──────────────┬──────────────┐";BS$
150 PRINT#4,DE$;"│              │              │";BS$
160 PRINT#4,DE$;"│              │              │";BS$
170 PRINT#4,DE$;"├──────────────┼──────────────┤";BS$
180 PRINT#4,DE$;"│              │              │";BS$
190 PRINT#4,DE$;"│              │              │";BS$
200 PRINT#4,DE$;"├──────────────┼──────────────┤";BS$
210 PRINT#4,DE$;"│              │              │";BS$
220 PRINT#4,DE$;"│              │              │";BS$
230 PRINT#4,DE$;"└──────────────┴──────────────┘"
240 :
250 FOR I=1 TO 8:PRINT#4:NEXT I
260 CLOSE4
```

RUN



11. Quotation Marks " or CHR$(34)

In order to print quotation marks around particular characters, use the character code [CHR$(34)]. When incorporating quotation marks in your program for print statement purposes, use them logically and effectively, do not place any together unless the program design specifically requires it.
The printed output of the example 1 below will be:

```
"COMMODORE"


"BUSINESSQUOTE$


"  0  "
```

Line 130 forms the print routine for "COMMODORE"
Line 150 will print "BUSINESSQUOTES" because both BUSINESS and CHR$ (34) are enclosed within their own quotes.
Line 170 will print " 0 " because the word MACHINES is taken as a numeric variable since it is not enclosed within quotes and it's contents are naturally zero.

EXAMPLE 1:

```
100 REM QUOTE MARK OR CHR$(34)
110 OPEN 4,4 :REM PRINT IN GRAPHIC MODE
120 QUOTE$=CHR$(34)
130 PRINT#4,QUOTE$;"COMMODORE";QUOTE$
140 GOSUB230
150 PRINT#4,QUOTE$;"BUSINESSQUOTE$
160 GOSUB230
170 PRINT#4,QUOTE$;MACHINES;QUOTE$
180 GOSUB230
190 FOR I=1 TO 8:PRINT#4:NEXT I
200 CLOSE4
210 END
220 :
230 FOR J=1 TO 2:PRINT#4:NEXT J
240 RETURN
```

If an odd number of quotation marks have been transmitted, control characters are made visible. This can be particularly useful when you are making a listing a BASIC program containing control characters in quotation marks.

EXAMPLE 2: (Graphic Mode)

```
100 REM CONTROL CHARACTERS
110 PRINT"■ HOME"
120 PRINT"■ CLR"
130 PRINT"■ CRSR DOWN"
140 PRINT"■ CRSR UP"
150 PRINT"■ CRSR RIGHT"
160 PRINT"■ CRSR LEFT"
170 PRINT"■ RVS ON"
180 PRINT"■ RVS OFF"
190 PRINT"■ F1"
200 PRINT"■ F3"
210 PRINT"■ F5"
220 PRINT"■ F7"
230 PRINT"■ F2"
240 PRINT"■ F4"
250 PRINT"■ F6"
260 PRINT"■ F8"
270 PRINT"■ BLACK"
280 PRINT"■ WHITE"
290 PRINT"■ RED"
300 PRINT"■ CYAN"
310 PRINT"■ PURPLE"
320 PRINT"■ GREEN"
330 PRINT"■ BLUE"
340 PRINT"■ YELLOW"
350 REM COMMODORE 64
360 PRINT"■ ORANGE"
370 PRINT"■ BLOWN"
380 PRINT"■ LIGHT RED"
390 PRINT"■ DARK GREY"
400 PRINT"■ MED GREY"
410 PRINT"■ LIGHT GREEN"
420 PRINT"■ LIGHT BLUE"
430 PRINT"■ LIGHT GREY"
440 OPEN4,4:CMD4:LIST

READY.
```

EXAMPLE 3: (Business Mode)

```
100 rem control characters
110 print"■ home"
120 print"■ clr"
130 print"■ crsr down"
140 print"■ crsr up"
150 print"■ crsr right"
160 print"■ crsr left"
170 print"■ rvs on"
180 print"■ rvs off"
190 print"■ f1"
200 print"■ f3"
210 print"■ f5"
220 print"■ f7"
230 print"■ f2"
240 print"■ f4"
250 print"■ f6"
260 print"■ f8"
270 print"■ black"
280 print"■ white"
290 print"■ red"
300 print"■ cyan"
310 print"■ purple"
320 print"■ green"
330 print"■ blue"
340 print"■ yellow"
350 rem commodore 64
360 print"■ orange"
370 print"■ blown"
380 print"■ light red"
390 print"■ dark grey"
400 print"■ med grey"
410 print"■ light green"
420 print"■ light blue"
430 print"■ light grey"
440 open 7,4,7:cmd7:list

ready.
```

12. Data Buffer Size

Your printer's print-line buffer can contain up to 90 bytes of data. At least 1 byte will be used for the CHARACTER code mode. But . . . since your printer provides you with automatic printing, you are guaranteed that no loss of data due to overflow will occur. This means that you really don't have to worry about buffer size. In addition to the print data, the following will also be included in your buffer:

Input Code	Bytes
CHR$(8)	1
CHR$(10)	1
CHR$(13)	1
CHR$(14)	1
CHR$(15)	1
CHR$(16)/CHR$(HI)/CHR$(LO)	4
CHR$(17)	1
CHR$(18)	1
CHR$(26)/"nHnL".	4
CHR$(27)/CHR$(16)/CHR$(nH)/CHR$(nL)	4
CHR$(145)	1
CHR$(146)	1

APPENDICES

APPENDIX A: MPS-803 Printer Specifications

1. General Specifications

A.	Print method	Impact Dot Matrix
B.	Printing direction	Bi-directional
C.	Character matrix	7 x 6 dot matrix
D.	Characters	Upper/lower case characters, numerals, symbols, and PET graphic characters
E.	Bit image type	7 Vertical Dots Bit Image Printing
F.	Character codes	CBM ASCII CODE (8 Bit)
G.	Character composition	Vertical: 7 dots (0.09", 2.4mm) Horizontal: 6 dots (0.08", 2.2mm)
H.	Dot size	0.3mm (wire diameter) Horizontal pitch . . . . . . 1/60" Vertical pitch . . . . 1/72"
I.	Print speed	60 characters per second
J.	Column width	80 characters
K.	Column spacing	10 characters/inch
L.	Line spacing	6 lines/inch (USA) or 8 lines/inch (Europe). 72/7 lines/inch in bit image printing
M.	Line feed speed	4 lines/sec . . . . in character printing 5.6 lines/sec . . . in bit image printing
N.	Paper feed method	Friction feed Tractor feed optional
O.	Paper width	Cut sheet A4 210.8mm (8.3") Letter size 216mm (8.5") Continuous 101.6mm (4.0") to 254mm (10") With optional tractor feed
P.	Number of copies	Original + 2 copies
Q.	Inked ribbon	Cassette type fabric ribbon (black) 8mm x 10 meters
R.	Ribbon life	1.2 x 10 characters

S.	Head life	20 million characters min.
T.	External dimensions	330(W) x 190(D) x 70(H)mm
U.	Weight	Approximately 2.0 kg

2. Operating Environment

A.	Power source	117V (USA, Canada), 220–240V (Europe) AC+/–10%, 50/60Hz
B.	Power consumption	30 watts max. (character printing) 8 watts (idling)
C.	Temperature	5°C – 35°C
D.	Humidity	20% – 80% (no condensation)

APPENDIX B: CBM ASCII Code Table & Font Table

1. Graphic Mode

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16 POS	32	48 0	64 @	80 P	96	112	128	144	160	176	192	208	224	240
1	1	17 CRSR DOWN	33 !	49 1	65 A	81 Q	97	113	129	145 CRSR UP	161	177	193	209	225	241
2	2	18 RVS ON	34 "	50 2	66 B	82 R	98	114	130	146 RVS OFF	162	178	194	210	226	242
3	3	19	35 #	51 3	67 C	83 S	99	115	131	147	163	179	195	211	227	243
4	4	20	36 $	52 4	68 D	84 T	100	116	132	148	164	180	196	212	228	244
5	5	21	37 %	53 5	69 E	85 U	101	117	133	149	165	181	197	213	229	245
6	6	22	38 &	54 6	70 F	86 V	102	118	134	150	166	182	198	214	230	246
7	7	23	39 '	55 7	71 G	87 W	103	119	135	151	167	183	199	215	231	247
8	8 BS	24	40 (	56 8	72 H	88 X	104	120	136	152	168	184	200	216	232	248
9	9	25	41)	57 9	73 I	89 Y	105	121	137	153	169	185	201	217	233	249
A	10 LF	26 SUB	42 *	58 :	74 J	90 Z	106	122	138	154	170	186	202	218	234	250
B	11	27 ESC	43 +	59 ;	75 K	91 [	107	123	139	155	171	187	203	219	235	251
C	12	28	44 ,	60 <	76 L	92	108	124	140	156	172	188	204	220	236	252
D	13 CR	29	45 -	61 =	77 M	93]	109	125	141	157	173	189	205	221	237	253
E	14 EN ON	30	46 .	62 >	78 N	94	110	126	142	158	174	190	206	222	238	254
F	15 EN OFF	31	47 /	63 ?	79 O	95	111	127	143	159	175	191	207	223	239	255

NOTE: When an odd number of CHR$(34) is detected in a line, the control codes $00–$1F and $80–$9F will be made visible by printing a reverse character for each of these controls. This will continue until and even number of quotes [CHR$(34)] has been received or until end of this line.

2. Business Mode

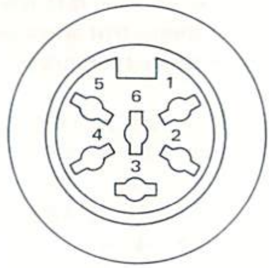
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16 POS	32	48 0	64 @	80 p	96	112 P	128	144	160	176	192	208	224	240
1	1	17 CRSR DOWN	33 !	49 1	65 a	81 q	97 A	113 Q	129	145 CRSR UP	161	177	193	209	225	241
2	2	18 RVS ON	34 "	50 2	66 b	82 r	98 B	114 R	130	146 RVS OFF	162	178	194	210	226	242
3	3	19	35 #	51 3	67 c	83 s	99 C	115 S	131	147	163	179	195	211	227	243
4	4	20	36 $	52 4	68 d	84 t	100 D	116 T	132	148	164	180	196	212	228	244
5	5	21	37 %	53 5	69 e	85 u	101 E	117 U	133	149	165	181	197	213	229	245
6	6	22	38 &	54 6	70 f	86 v	102 F	118 V	134	150	166	182	198	214	230	246
7	7	23	39 '	55 7	71 g	87 w	103 G	119 W	135	151	167	183	199	215	231	247
8	8 BS	24	40 (	56 8	72 h	88 x	104 H	120 X	136	152	168	184	200	216	232	248
9	9	25	41)	57 9	73 i	89 y	105 I	121 Y	137	153	169	185	201	217	233	249
A	10 LF	26 SUB	42 *	58 :	74 j	90 z	106 J	122 Z	138	154	170	186	202	218	234	250
B	11	27 ESC	43 +	59 ;	75 k	91 [	107 K	123	139	155	171	187	203	219	235	251
C	12	28	44 ,	60 <	76 l	92 £	108 L	124	140	156	172	188	204	220	236	252
D	13 CR	29	45 -	61 =	77 m	93]	109 M	125	141	157	173	189	205	221	237	253
E	14 EN ON	30	46 .	62 >	78 n	94 ↑	110 N	126	142	158	174	190	206	222	238	254
F	15 EN OFF	31	47 /	63 ?	79 o	95 ←	111 O	127	143	159	175	191	207	223	239	255

NOTE: When an odd number of CHR$(34) is detected in a line, the control codes $00–$1F and $80–$9F will be made visible by printing a reverse character for each of these controls. This will continue until an even number of quotes [CHR$(34)] has been received or until end of this line.

APPENDIX C: Serial Interface Information

1. The Connector

Pin No.	Signal
1	SERIAL SRQ
2	GND
3	SERIAL ATN
4	SERIAL CLK
5	SERIAL DATA
6	RESET



2. The Interface:

a. Plug the serial interface cable supplied with your Printer into the Serial Bus connector for the connection. Refer to Chapter 1 Part E for details on how to connect your Printer to your computer.

b. When the printer is printing, no data will be transferred from the computer (the data line is said to be **low**). When the printer is at rest, data can be transferred from the computer (the data line is said **high**).

c. When printer error occures, all control circuits inside the Printer will stop.

APPENDIX D: Hardcopy of the Text Screen

The following sample program can be used to get a hard printed copy of a program you have on your text screen. The Program is made to be used as a subroutine. That means that when you use it, you must have a "GOSUB 60000" in your program where appropriate.

```
60000 REM HARDCOPY OF TEXT SCREEN
60010 PO$=CHR$(16)  :QT$=CHR$(34)
60020 RV$=CHR$(18)  :RO$=CHR$(146)
60030 VR=PEEK(648)*256
60040 OPEN 4,4           :REM PRINT IN GRAPHIC MODE
60050 FOR CL=0 TO 22  :QF=0:AS$=""
60060 FOR RO=0 TO 21
60070 SC=PEEK(VR+22*CL+RO)
60080 IF SC=34 THEN QF=1-QF
60090 IF SC<>162 THEN 60120
60100 QF=1-QF:IFQF=1THENAS$=AS$+RV$+QT$:GOTO60180
60110 AS$=AS$+QT$+RO$:GOTO60180:GOTO60140
60120 IFQF=1AND(SC>=128)THENSC=SC-128:GOTO60140
60130 IFSC>=128THENSC=SC-128:RF=1:AS$=AS$+RV$
60140 IFSC<32ORSC>95THENAS=SC+64:GOTO60170
60150 IFSC>31ANDSC<64THENAS=SC:GOTO60170
60160 IFSC>63ANDSC<96THENAS=SC+32:GOTO60170
60170 AS$=AS$+CHR$(AS)
60180 IFRF=1THENAS$=AS$+RO$:RF=0
60190 NEXT RO
60200 IFQF=0THENPRINT#4,PO$"20"AS$:GOTO60220
60210 PRINT#4,PO$"20"AS$QT$
60220 NEXT CL
60230 CLOSE4
60240 RETURN
```

This program is made for Graphic Mode. If you wish to write the program in Business Mode, you must change OPEN 4, 4 to OPEN 4, 4, 7 in line 60040.

This program is also made for VIC-20. If you wish to use this program to Commodore 64, you should change line 60050, 60060.

```
60050 FOR CL=0 TO 24  :QF=0:AS$=""
60060 FOR RO=0 TO 39
60070 SC=PEEK(VR+40*CL+RO)
```

NOTE: This program can't print the characters following the reverse quote.

INDEX

USER'S GUIDE STATEMENT

"This equipment generates and uses radio frequency energy. If it is not properly installed and used in strict accordance with the manufacturer's instructions, this equipment may interfere with radio and television reception. This machine has been tested and found to comply with the limits for a Class B computing device peripheral in accordance with the specifications in Subpart 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. If you suspect interference, you can test this equipment by turning if off and on. If you determine that there is interference with radio or television reception, try one or more of the following measures to correct it:

- reorient the receiving antenna
- move the computer away from the receiver
- change the relative positions of the computer equipment and the receiver
- plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult your Commodore dealer or an experienced radio/television technician for additional suggestions. You may also wish to consult the following booklet, which was prepared by the Federal Communications Commission:

"How to identify and Resolve Radio-TV Interference Problems" This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4."

IMPORTANT: Shield interface cable must be used according to FCC 15.838D

FOR USERS IN UK

WARNING: THIS APPARATUS MUST BE EARTHED

IMPORTANT. The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow	: Earth
Blue	: Neutral
Brown	: Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured marking identifying the terminals in your plug proceed as fllows:

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured green or green-and-yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

DISK DRIVES

MODEL 1541

Media compatible with 4040 and 2031LP diskettes.
170 K of memory per single side disk.
Serial port interface.

PRINTERS

MODEL MCS-801

Seven color, dot matrix printing.
Up to 80 columns printed per page.
Prints 38 characters per second.
Perfect for everything from personal letters to important business reports.
Serial port interface.

PRINTER/PLOTTER

MODEL 1520

Four color, printer/plotter for all graphic needs.
Print bar graphs. . . create pie charts. . . plot time graphs.
High quality printing in a variety of styles and sizes.
Great for graphic artists.

MODEMS

VICMODEM

Timely financial information, news and reference libraries are as near as your phone.
An affordable introduction to the growing world of phone/computer services.
Communicate with a wide variety of computer users who already own a modem.

AUTOMODEM

The convenience of automatic ansering and dialing.
The resource power of telecomputing services.
Turn your phone into a telecomputing information network.

commodore COMPUTERS

Printed in Japan